Inertia-Rama! : Please attach a piece of paper for conclusions for each of these labs.

2 pts ec printing

Inertia is a property of all matter, from small particles of dust to enormous planets and stars. In this lab, you will investigate the inertia of various shapes and types of matter. Keep in mind that each investigation requires you to either overcome or use the object's inertia. --

Station 1: Magic Eggs

Procedure

1. There are two eggs at this station—one is hard-boiled (solid all the way through) and the other is raw (liquid inside). The masses of the two eggs are about the same. The eggs are marked so that you can tell them apart.
2. You will spin each egg and then stop it from spinning by placing a finger on its center. Before you do anything to either egg, write some predictions. Which egg will be the easiest to spin? Which egg will be the easiest to stop?
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   ____
3. Spin the hard-boiled egg. Then place your finger on it to make it stop spinning. What did you observe?
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   ____
4. Repeat step 3 with the raw egg. What did you observe?
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5. Compare your predictions with your observations. (Repeat steps 3 and 4 if necessary.) What did you observe?
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Analysis

6. Explain why the eggs behave differently when you spin them even though they should have the same inertia. (Hint: Think about what happens to the liquid inside the raw egg.) In terms of inertia, explain why the eggs react differently when you try to stop them. ____

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Station 2: Coin in a Cup

Procedure

1. At this station, you will find a coin, an index card, and a cup. Place the card over the cup. Then place the coin on the card over the center of the cup.

   Write down a method for getting the coin into the cup without touching the coin and without lifting the card.

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2. Try your method. If it doesn't work, try again until you find a method that does work. When you are done, place the card and coin on the table for the next group.

Analysis

Use Newton's first law of motion to explain why the coin falls into the cup if you remove the card quickly.

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Explain why pulling on the card slowly will not work, even though the coin has inertia. (Hint: Friction is a force.)

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Station 3: Momentum Magic

Procedure

1. At this station, you will find a 1/2 inch track made of 2 taped meter sticks. Put 2 marbles in the middle of the meter sticks. Flick a marble so that it rolls and hits the other one. Record your observations.

2. Now put two marbles on the track so they touch, and a third several inches away. Flick the single marble into the other two. Record your observations.

3. Try other combinations: two marbles into three still marbles, or three into three.

Analysis: Use the *law of conservation of momentum* to explain your observations.

Station 4: Hot Wheelin' Physics

In this lab you're going to pull back the little cars and record the time it takes them to go to point A, B, C, D. Be sure to record your lab results in the charts!

Trial 1:

Point	Distance	Time
A		
B		
C		
D		
E		

Trial 2:

Point	Distance	Time
A		
B		
C		
D		
E		

Trial 3:

Point	Distance	Time
A		
B		
C		
D		
E		

Speed = Distance ÷ Time

1. Calculate the speed for each trial using the **total time** and **total distance**. Show your work!

   Trial 1: ___________ Trial 2: ___________ Trial 3: ___________

2. Calculate the speed from **Point B to Point C** for each trial. Show your work!

   Trial 1: ___________ Trial 2: ___________ Trial 3: ___________

3. Calculate the speed from **Point D to Point E** for each trial. Show your work!

   Trial 1: ___________ Trial 2: ___________ Trial 3: ___________

4. Construct a graph to show your results. Be sure to label each graph!

Trial 1:

Trial 2:

Trial 3:

5. Do your graphs represent a constant speed or an average speed?
6. Are your results reliable? Explain on a separate sheet of paper

Station 5: Time Trials

Step1: Set up a ramp by holding a meter stick 50 cm from the floor. (The side cupboards have been marked with masking tape showing this height) Line up the other end to the masking tape marked on the floor. Place an additional meter stick there for measuring the distance your little car will travel.

Step2: Place your chosen vehicle at the top of your meter stick ramp, and let it roll down the ramp. Record how far the vehicle rolls. Record the distance in the table below. Repeat this step 2 more times and record.

Step 3: Add 1 Large washers to the vehicle and repeat the process from step 2. Repeat 2 more times. Record these measurements in the chart. (be sure all washers remain on the vehicle!)

Step 4: Place 5 Large washers to the vehicle and repeat the process from step 2. Repeat 2 more times. Record these measurements in the chart. (be sure all washers remain on the vehicle!)

# of washers	Distance in cm			Average Distance
	Trial 1	Trial 2	Trial 3	
0				
1				
5				

Analysis:

1. How does increasing mass (adding more washers) affect the force of objects in motion (the distance the vehicle rolls)? Explain your answer using data from the chart. ____

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2. What would happen if you added 10 washers to the car? Predict how far the car would roll.

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3. Explain the results of your experiment in terms of Newton's 2nd Law.

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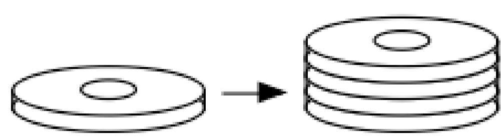
Station 6: Wacky Washers

Procedure

To prepare for this experiment, stack 4 washers on top of the other so that you form a tower of washers. Place the stack of washers on your desk or floor so that you have a smooth, slick surface. Aim one washer at the bottom of the stack of four washers ad give it a good hard flick with your finger or hand. What happens?



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Flick a stack of 2 washers into a stack of 4 washers. What happens?

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____
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Flick a stack of 4 washers into a stack of 4 washers. What happens?

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Explain your observations in terms of Newton's 1st Law (5 sentences)

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Station 7: Lab: Force = Mass x Acceleration

Purpose: To determine how a change in mass affects the velocity of a moving sphere.

Hypothesis: I hypothesize that ____
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Materials: wood plank, balance, meter stick, stopwatch, set of 5 balls, plastic beaker, calculators

Procedures

1. Set the wood plank up on 3 textbooks. Place a plastic beaker at the end of the plank to "catch" each ball.
2. Measure the distance from the Starting Line to the end of the plank & record: _________________ **m**
3. Find the **Mass** of each ball in kilograms by using a calibrated balance. Record in the table.
4. Hold the first object at the starting line. Use the stopwatch to time how long it takes for the ball to roll down the plank to the finish line. *Record as accurately as possible.* Conduct 3 trials for each ball.
5. Calculate the **Average Time** by adding the 3 trials & dividing the number by 3.
6. Calculate the **Velocity** of the moving object by using the following equation:

$$\text{Velocity} = \frac{\text{Distance (m)}}{\text{Time (s)}}$$

← length of track

← average time of 3 trials

7. Calculate the **Acceleration** of the moving object by using the following equation:

$$\text{Acceleration} = \frac{\text{FINAL VELCOCITY – INITIAL VELOCITY (M/S)}}{\text{AVERAGE TIME (S)}}$$

(initial velocity is 0 m/s)

8. Calculate the **Force** needed to move each ball by using the following equation:

$$\text{Force} = \text{Mass (kg)} \times \text{Acceleration (m/s}^2\text{)}$$

9. **DATA:** Repeat steps 3- for each of the 5 types of balls and record the **Data.**

Ball	Mass (kg)	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)	Average Time (s)	Velocity (m/s)	Acceleration (m/s^2)	Force (N)
1.Bouncy Ball								
2.Marble								
3.Golf Ball								
4.Ping-Pong Ball								
5.Metal Sphere								

Conclusion: Write thorough answers to the following questions on separate sheet of paper.

1. What can you conclude about the affect of mass on the acceleration of a moving ball? Use data to support your answer.
2. Would changing the height or angle of the plank change the results? Explain your answer.
3. Imagine that you repeated this experiment, but instead of rolling the balls down a plank, you held them 2 meters above the ground and timed their descent. Do you expect the same results? Explain.